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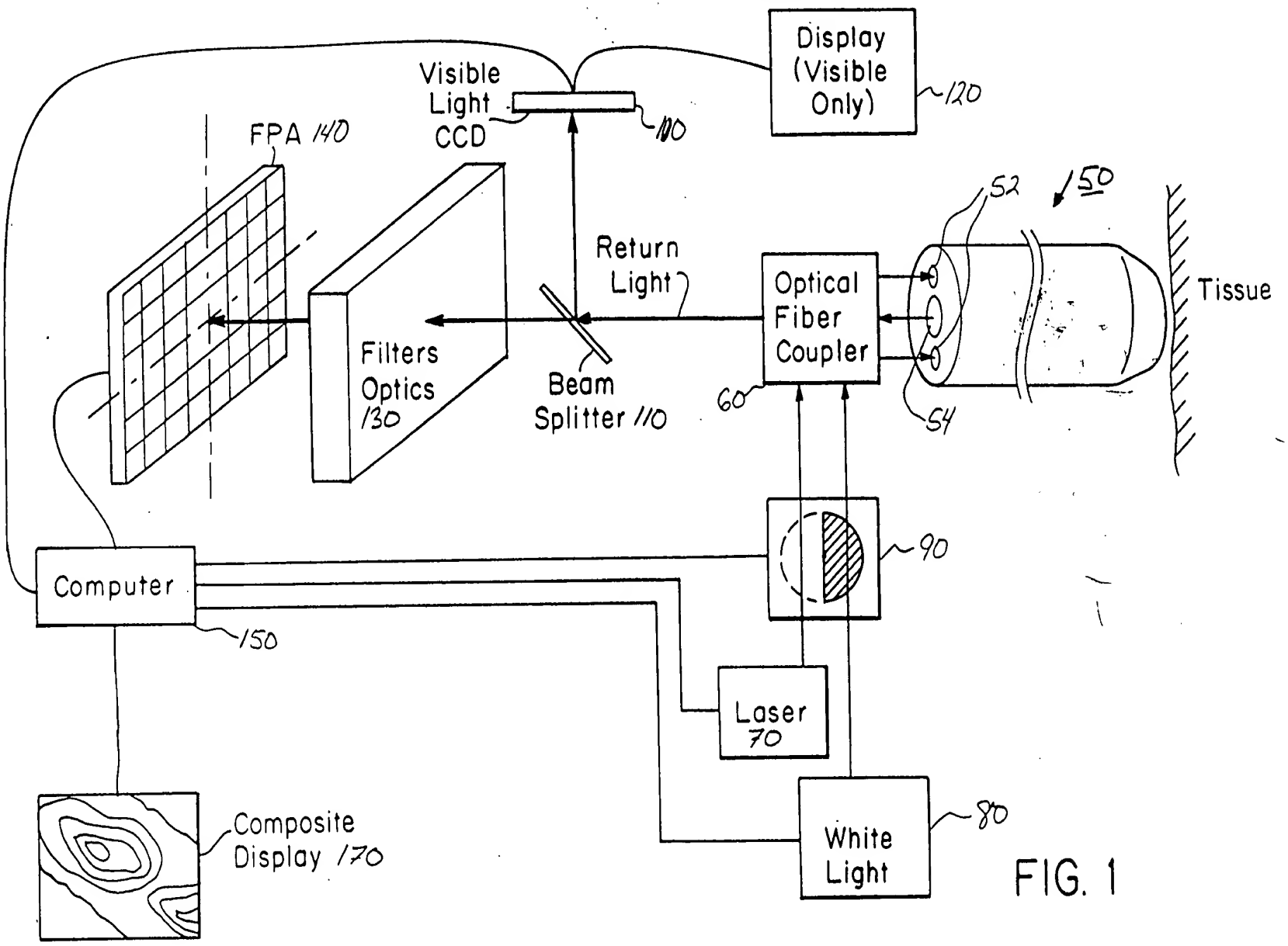


FIG. 1

Fig. 2

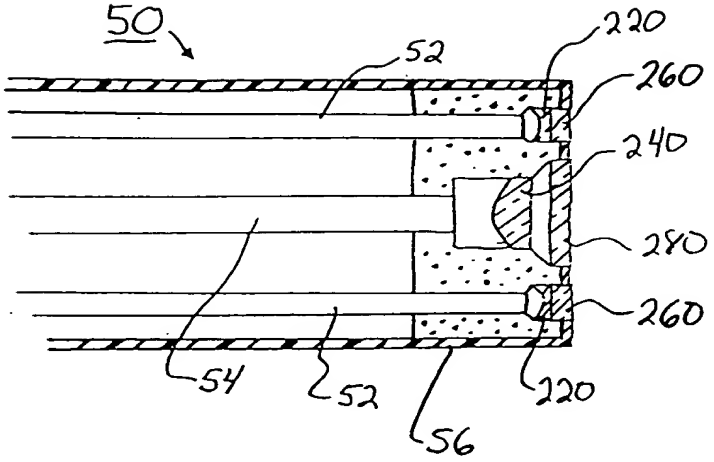


Fig. 3

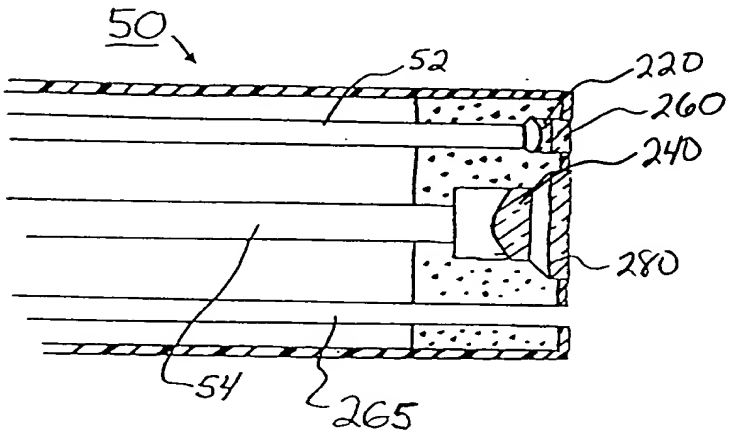


Fig 4

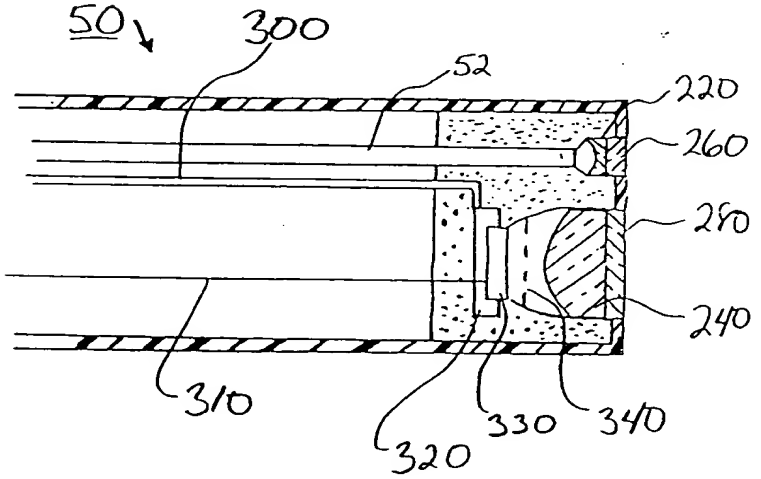
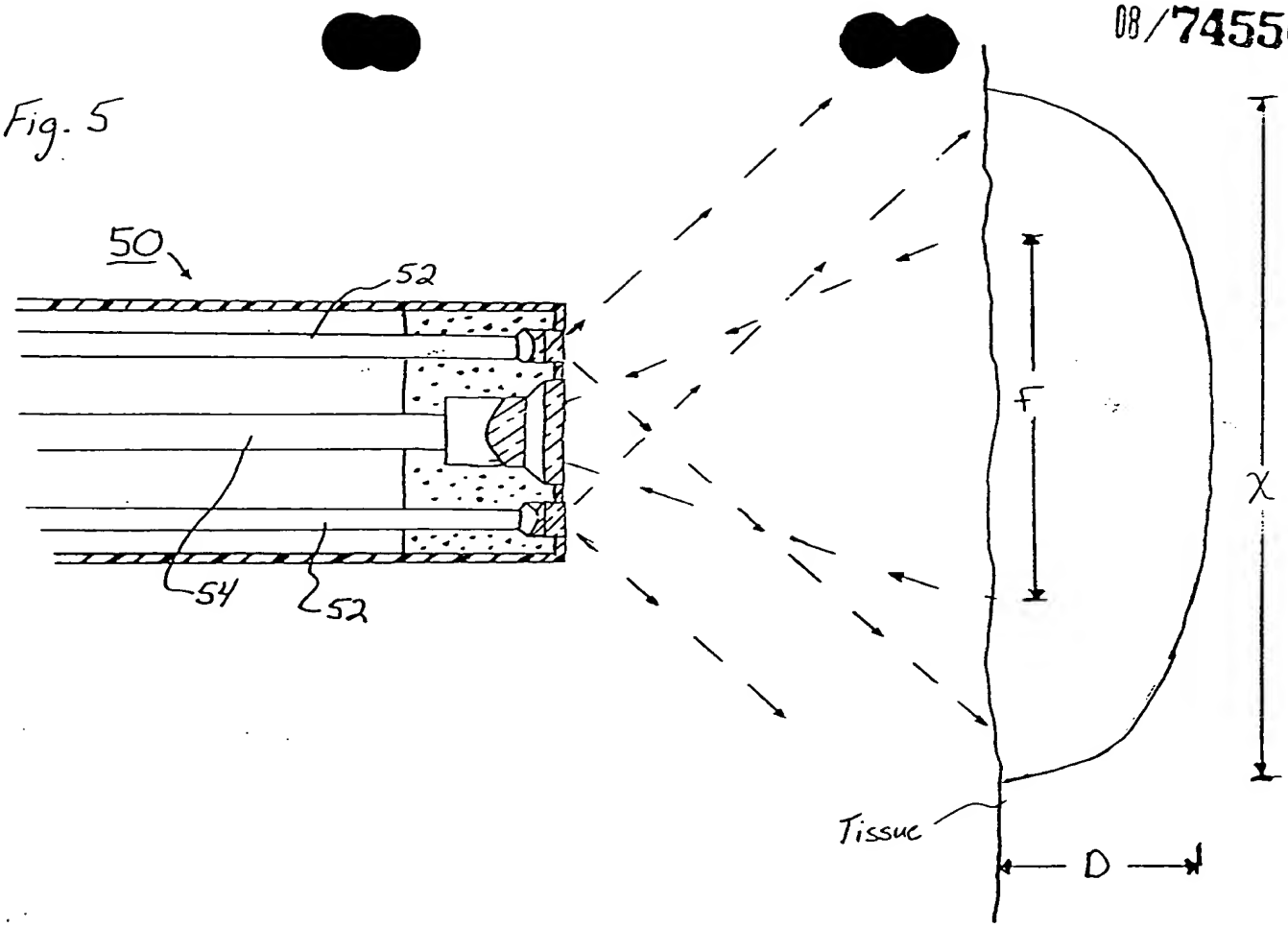


Fig. 5



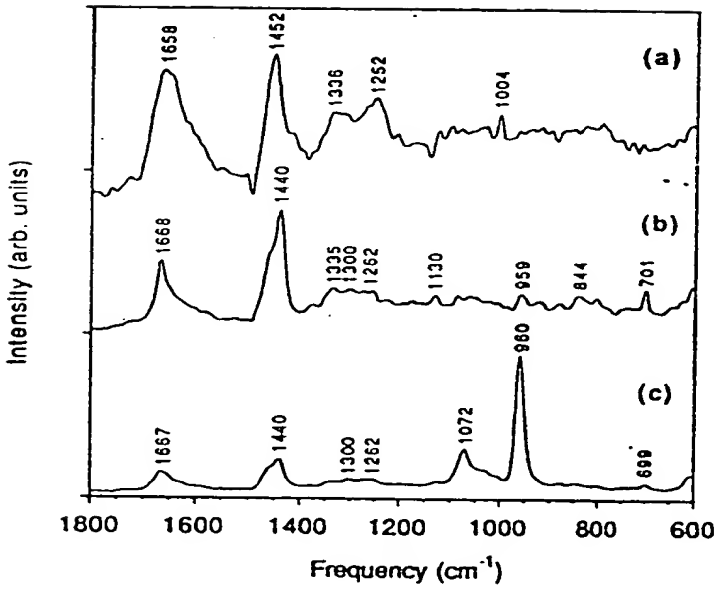

1658
1452
1336
1252
1004
(a)
1440
1668
1335
1300
1262
1130
959
844
701
(b)
980
1667
1440
1300
1262
1072
699
(c)
Intensity (arb. units)
1800
1600
1400
1200
1000
800
600
Frequency (cm-1)

Fig. 6

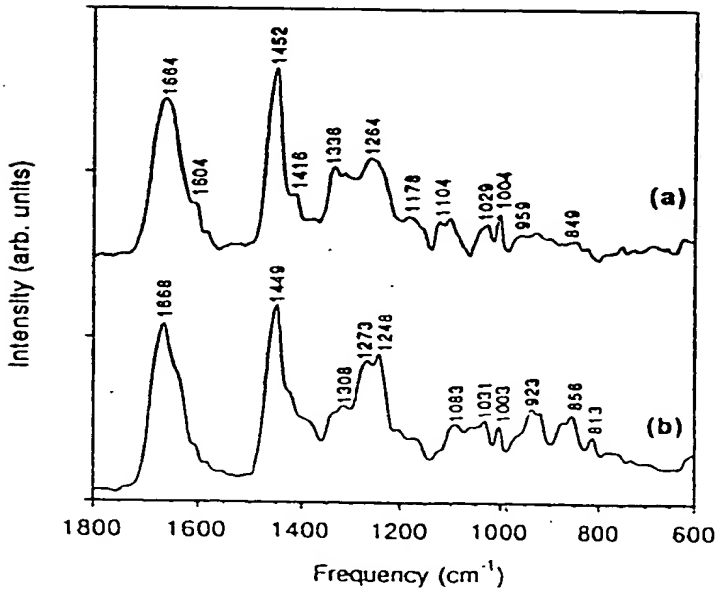

1684
1604
1452
1418
1338
1264
1178
1104
1029
1004
959
849
(a)
1868
1449
1308
1273
1248
1083
1031
1003
923
858
813
(b)
Intensity (arb. units)
1800
1600
1400
1200
1000
800
600
Frequency (cm-1)

Fig. 7

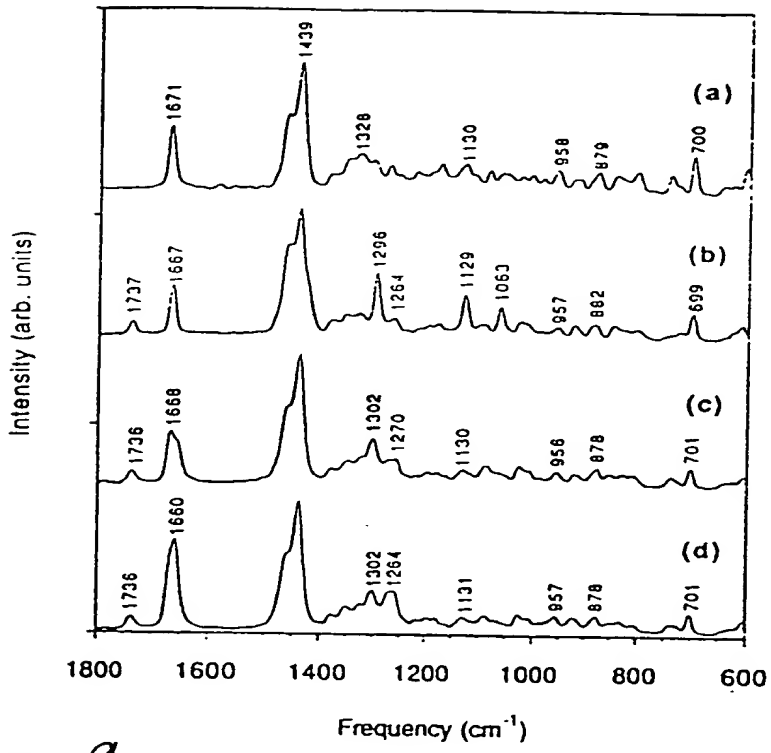

Intensity (arb. units)
1671
1439
1328
1130
958
879
700
(a)
1737
1667
1296
1264
1129
1063
957
882
699
(b)
1736
1668
1302
1270
1130
956
878
701
(c)
1736
1660
1302
1264
1131
857
878
701
(d)
1800
1600
1400
1200
1000
800
600
Frequency (cm-1)

Fig. 9

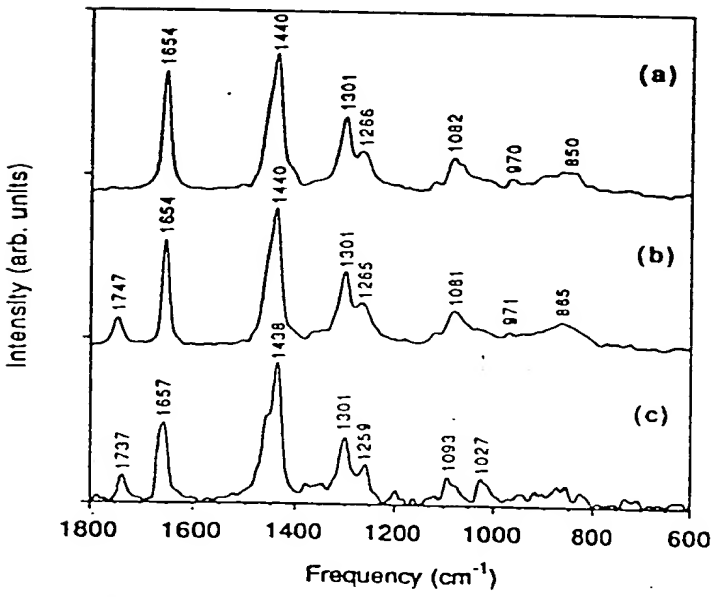

Intensity (arb. units)
1654
1440
1301
1266
1082
970
850
(a)
1747
1654
1440
1301
1265
1081
971
885
(b)
1737
1657
1438
1301
1259
1093
1027
(c)
1800
1600
1400
1200
1000
800
600
Frequency (cm-1)

Fig. 10

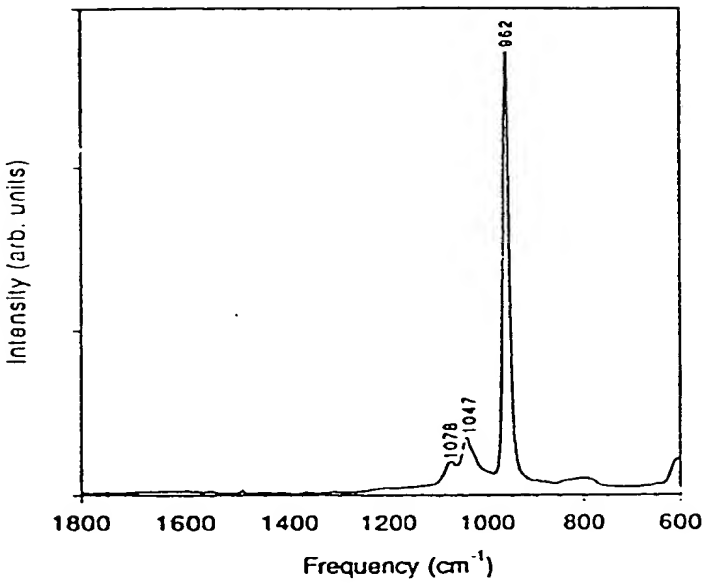

862
1078
1047
Intensity (arb. units)
1800
1600
1400
1200
1000
800
600
Frequency (cm^{-1})

Fig. 11

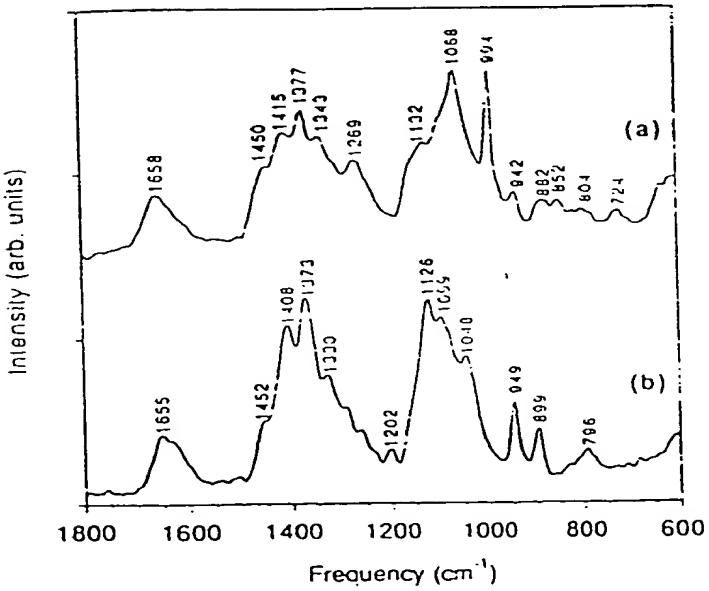

1658
1450
1415
1377
1343
1269
1132
1068
994
842
882
852
804
724
(a)
1655
1452
1408
1373
1330
1202
1126
1055
1040
949
899
796
(b)
Intensity (arb. units)
1800
1600
1400
1200
1000
800
600
Frequency (cm^{-1})

Fig. 8

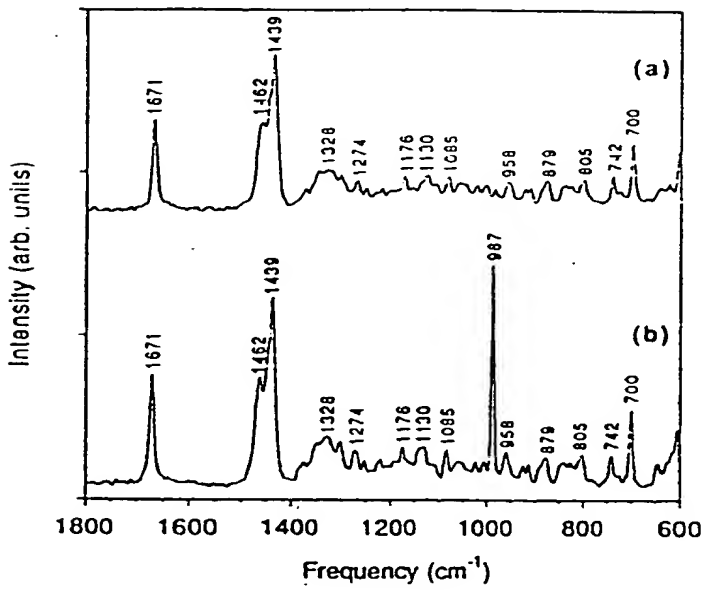

Intensity (arb. units)
(a)
(b)
1671
1462
1439
1328
1274
1176
1130
1085
987
958
879
805
742
700
1800
1600
1400
1200
1000
800
600
Frequency (cm^{-1})

Fig. 12

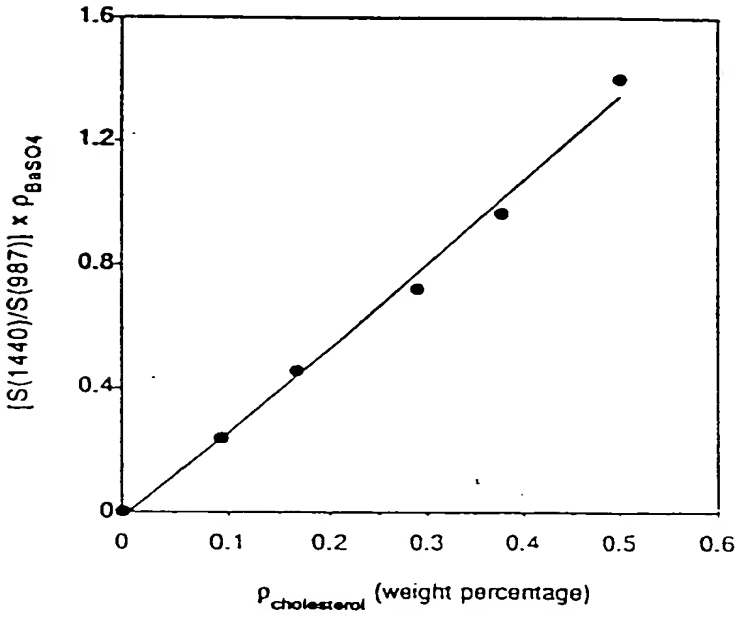

[S(1440)/S(987)] x ρ_{BaSO4}
1.6
1.2
0.8
0.4
0
0
0.1
0.2
0.3
0.4
0.5
0.6
$\rho_{cholesterol}$ (weight percentage)

Fig. 13

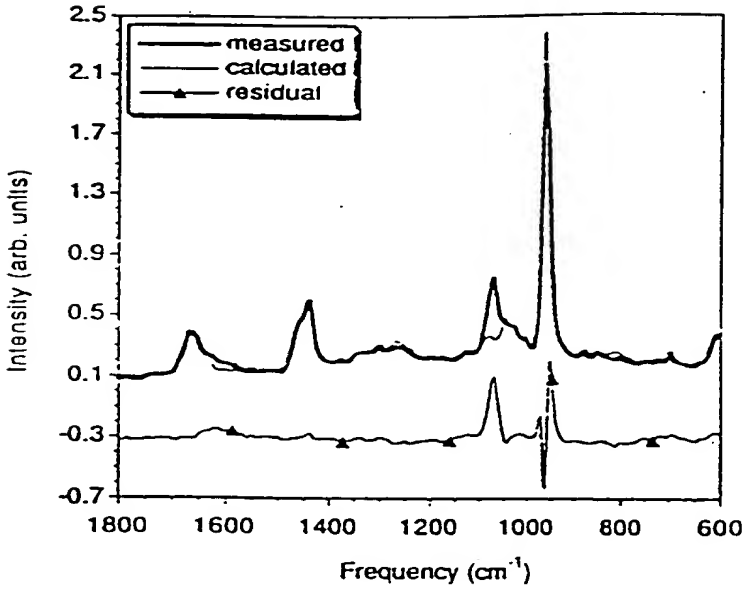

measured
calculated
residual
Intensity (arb. units)
2.5
2.1
1.7
1.3
0.9
0.5
0.1
-0.3
-0.7
1800
1600
1400
1200
1000
800
600
Frequency (cm-1)

Fig. 21

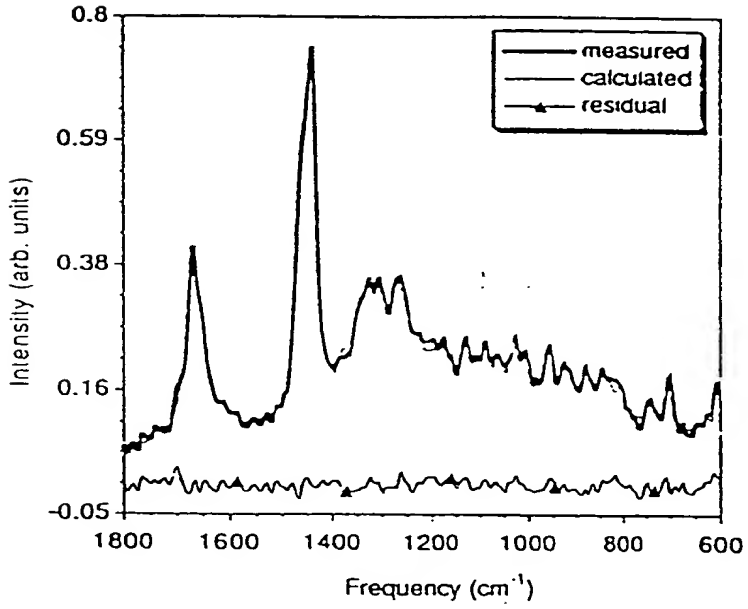
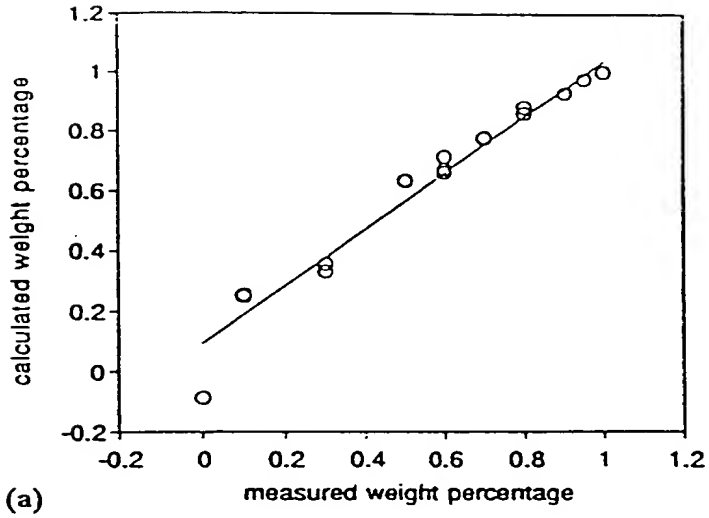
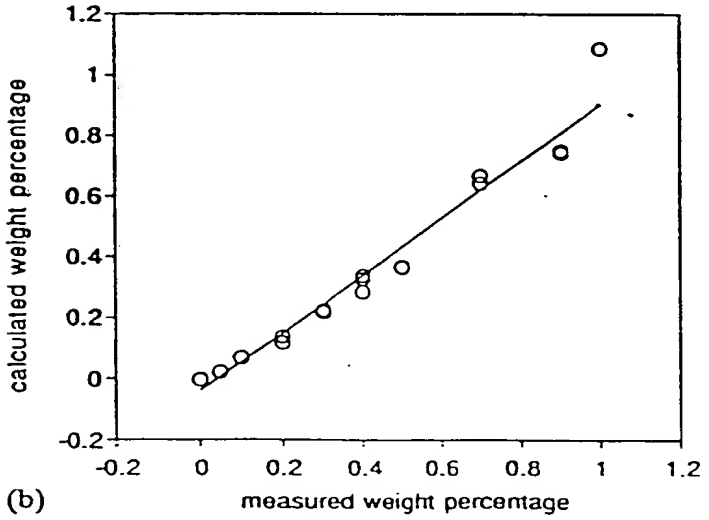

measured
calculated
residual
Intensity (arb. units)
0.8
0.59
0.38
0.16
-0.05
1800
1600
1400
1200
1000
800
600
Frequency (cm-1)

Fig. 14

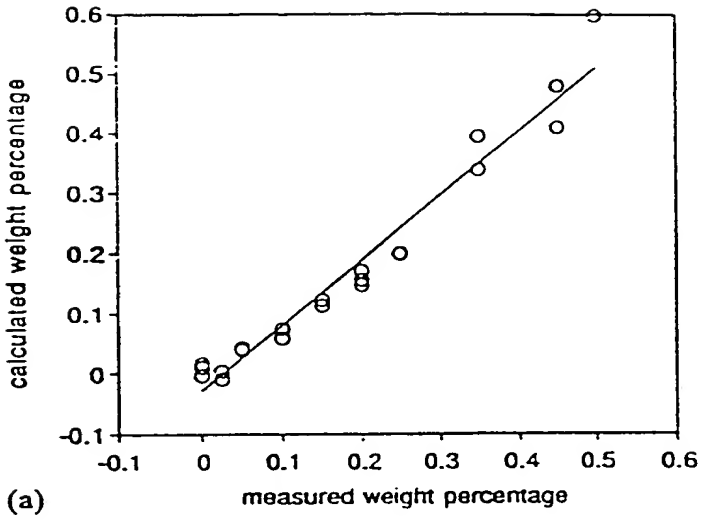

calculated weight percentage
measured weight percentage
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.2
0
0.2
0.4
0.6
0.8
1
1.2

(a)

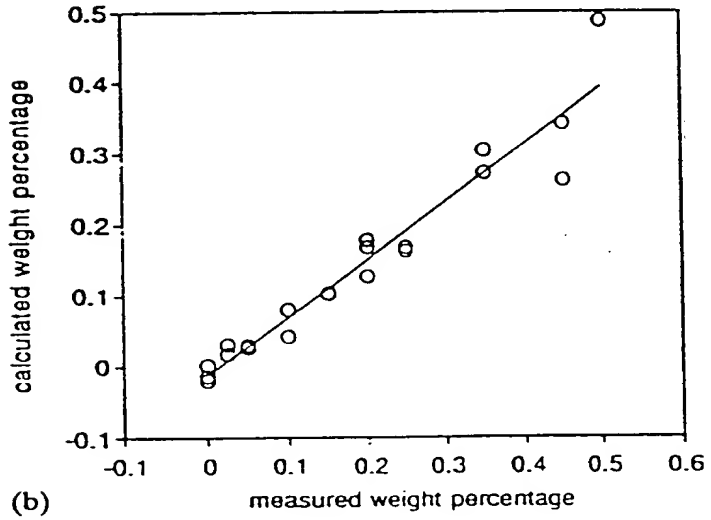

calculated weight percentage
measured weight percentage
1.2
1
0.8
0.6
0.4
0.2
0
-0.2
-0.2
0
0.2
0.4
0.6
0.8
1
1.2

(b)

Fig. 15

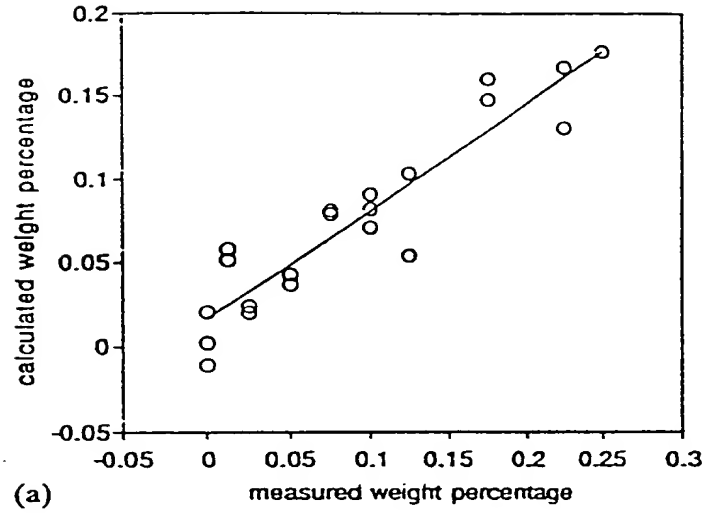

calculated weight percentage
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.1
0
0.1
0.2
0.3
0.4
0.5
0.6
measured weight percentage

(a)

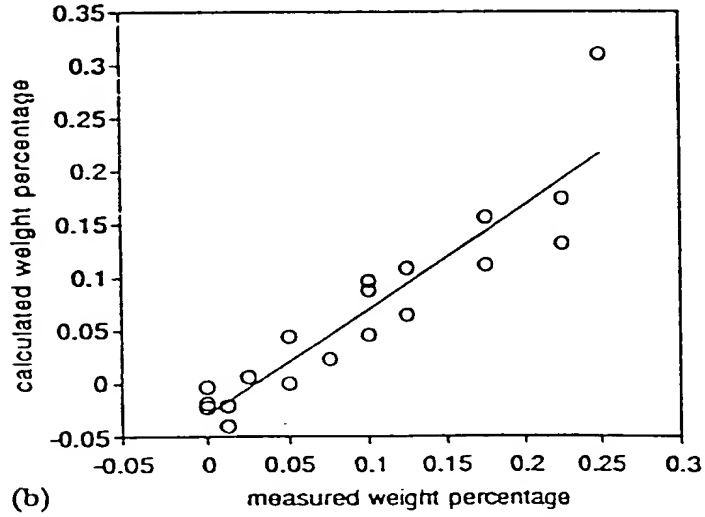

calculated weight percentage
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.1
0
0.1
0.2
0.3
0.4
0.5
0.6
measured weight percentage

(b)

Fig. 16

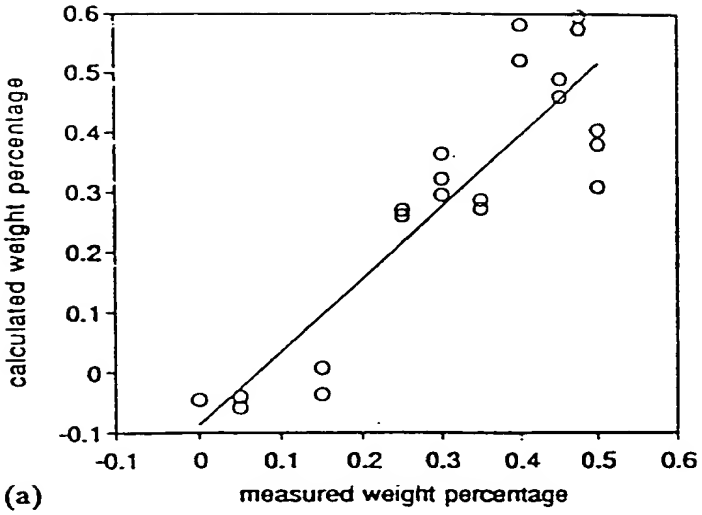

calculated weight percentage
0.2
0.15
0.1
0.05
0
-0.05
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
measured weight percentage

(a)

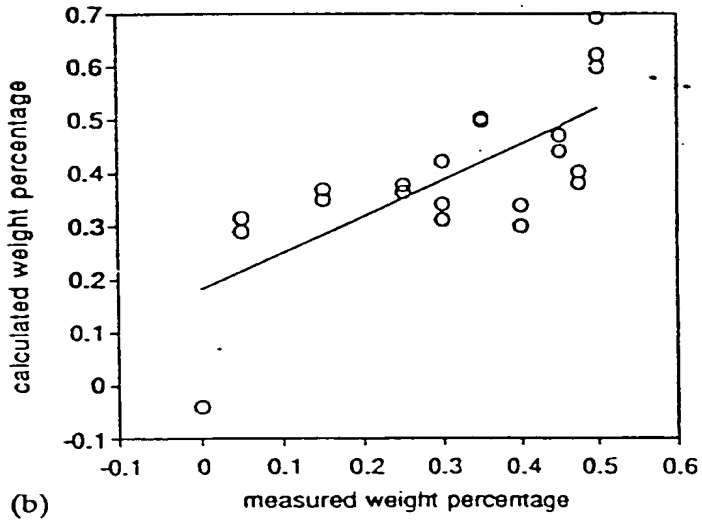

calculated weight percentage
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
-0.05
-0.05
0
0.05
0.1
0.15
0.2
0.25
0.3
measured weight percentage

(b)

Fig. 17


calculated weight percentage
measured weight percentage
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.1
0
0.1
0.2
0.3
0.4
0.5
0.6

(a)


calculated weight percentage
measured weight percentage
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
-0.1
-0.1
0
0.1
0.2
0.3
0.4
0.5
0.6

(b)

Fig. 18

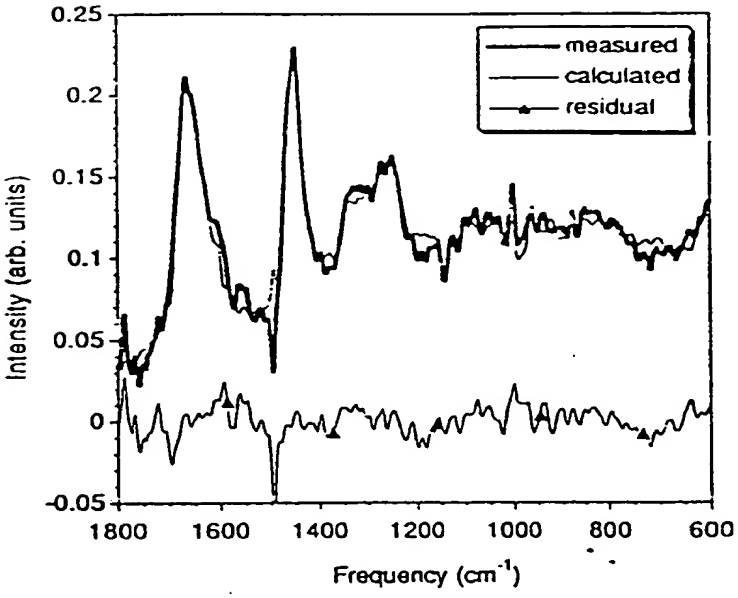

measured
calculated
residual
Intensity (arb. units)
0.25
0.2
0.15
0.1
0.05
0
-0.05
1800
1600
1400
1200
1000
800
600
Frequency (cm-1)

Fig. 19

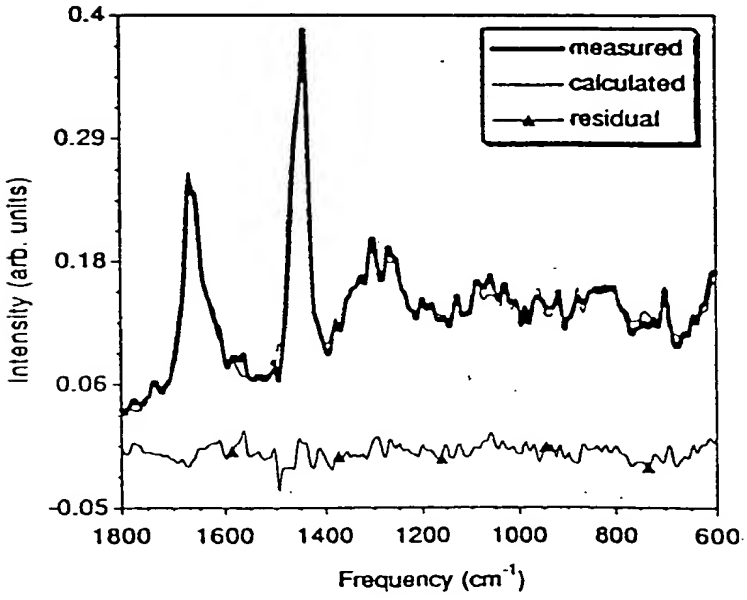

measured
calculated
residual
Intensity (arb. units)
0.4
0.29
0.18
0.06
-0.05
1800
1600
1400
1200
1000
800
600
Frequency (cm-1)

Fig. 20

962TTT 6055+780

TABLE 1

Raman scattering weight cross-sections of different bands from proteins and lipids typically found in atherosclerotic aorta relative to that of 1 g $BaSO_4$

Biological component	Vibrational assignment									
	Ester, C=O		-C=C-		CH_2 bend		C-C stretch		Sterol ring stretch	
	Freq. (cm^{-1})	Cross-section	Freq. (cm^{-1})	Cross-section	Freq. (cm^{-1})	Cross-section	Freq. (cm^{-1})	Cross-section	Freq. (cm^{-1})	Cross-section
Collagen	Amide I	1.00	–	–	1450	0.72	–	–	–	–
Elastin	Amide I	1.23	–	–	1450	0.79	–	–	–	–
Chondroitin sulfate A	Amide	0.18	–	–	~1400[a]	0.58	–	–	–	–
Hyaluronic acid	Amide	0.58	–	–	~1400[a]	0.79	–	–	–	–
Cholesterol	–	–	1671	0.77	1440	3.19	–	–	700	0.38
Cholesterol palmitate	1738	0.12	1667	0.36	1440	2.70	1130	0.35	700	0.13
Cholesteryl oleate	1738	0.12	1665	1.14	1440	3.70	1140	0.17	700	0.12
Cholesteryl linoleate	1740	0.11	1665	1.40	1440	3.02	1146	0.17	700	0.12
Palmitic acid	1737	0.52	–	–	1442	4.66	1130	0.76	–	–
Tripalmitin	1745	0.41	–	–	1440	4.32	1130	0.66	–	–

[a]Calculated for the entire band in the region 1300–1500 cm^{-1} and probably contains contributions from other modes as well.

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TABLE 2

Estimated absolute Raman scattering molecular cross-sections of different bands from lipids typically found in atherosclerotic aorta[a]. Units for the absolute cross-section values are 10^{-30} cm^2 (molecule·sr)$^{-1}$

Biological component	Vibrational assignment									
	Ester, C=O		-C=C-		CH_2 bend		C-C stretch		Sterol ring stretch	
	Absolute cross-section	Comparative[b]	Absolute cross-section	Comparative[c]	Absolute cross-section	Comparative[c]	Absolute cross-section	Comparative[b]	Absolute cross-section	Comparative[c]
Cholesterol	–	–	0.67	1	2.85	1	–	–	0.34	1
Cholesteryl palmitate	0.17	1	0.52	0.77	3.91	1.37	0.50	1	0.19	0.55
Cholesteryl oleate	0.18	1.06	1.73	2.58	5.58	1.96	0.26	0.52	0.18	0.53
Cholesteryl linoleate	0.17	1.00	2.1	3.13	4.53	1.59	0.26	0.52	0.18	0.53
Palmitic acid	–	–	–	–	2.77	0.97	0.45	0.9	–	–
Tripalmitin	0.76	4.49	–	–	8.07	2.83	1.23	2.46	–	–

[a]The Raman cross-section value for SO_4^{2-} is 0.54×10^{-30} cm^2 (molecule·sr)$^{-1}$, corrected for the wavelength dependence [16].
[b]Molecular cross-sections compared with given band of cholesteryl palmitate.
[c]Molecular cross-sections compared with given band of cholesterol.

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TABLE 3

Weight percentages for human aorta calculated from the Raman spectra

Biological component	Normal	Atheromatous	Exposed calcification
Collagen	0.31	0.35	0.68
Elastin	0.61	0.18	−0.006
Total protein	0.93	0.53	0.67
Cholesterol	0.003	0.14	0.088
Cholesteryl oleate	0.064	0.21	0.036
Cholesteryl linoleate	0.002	0.12	0.20
Total lipid[a]	0.068	0.47	0.33
Total cholesteryl ester[b]	0.066	0.32	0.24

[a]Cholesterol + cholesteryl oleate + cholesteryl linoleate.
[b]Cholesteryl oleate + cholesteryl linoleate.

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